

ANTIMONY

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About one-half of the primary antimony used in the United States went into flame-retardants; most of the remainder was used by the transportation, chemical, ceramics, and glass industries. Secondary antimony, which was derived almost entirely from recycled lead-acid batteries, was used in the manufacture of new batteries. The price of antimony metal, on average, was almost 5% higher than that of 1999. World production rose 9%.

A small amount of antimony was recovered as a byproduct of the mining of silver-copper ores at one mine in Idaho, but almost all primary antimony metal and oxide produced domestically originated from raw material imports. Primary smelter production declined 12%. Most domestic smelting consisted of upgrading imported antimony trioxide to a higher purity. Primary antimony metal and oxide, valued at \$41 million, were produced by four companies operating four plants—two in Texas and one each in Montana and New Jersey. One of these primary smelters ceased production permanently during the year. Secondary antimony was recovered from scrapped lead-acid batteries at secondary lead smelters. The amount of antimony used by battery manufacturers is substantially lower than it was 10 years ago because of changing materials requirements for batteries. Industry stocks declined slightly (table 4).

Antimony was mined as a principal product and was a byproduct of the smelting of base-metal ores in 15 countries. Ninety-five percent of world primary antimony was mined in China (85%), South Africa (4%), Russia (4%), and Bolivia (2%) (table 9). World antimony reserves were estimated to be 2.1 million metric tons (Carlin, 2001).

Legislation and Government Programs

Sales of antimony from the National Defense Stockpile (NDS) proceeded for the eighth consecutive year. Sales were conducted on a negotiated bid basis and were held by Defense National Stockpile Center (DNSC) on the third Monday of each month. There was no maximum limit on the quantity for which a company could submit a bid, but the minimum quantity allowed was 18,144 kilograms (40,000 pounds). The materials offered were grade A and grade B ingots, cake, and broken pieces. All antimony sulfide ore held in the NDS has been sold. In calendar year 2000, 4,536 metric tons (t) of antimony was sold. At yearend 2000, the antimony inventory in the DNSC was 8,275 t. Antimony was stockpiled in Government warehouses at three depots, with Somerville, NJ, holding the largest amount (Defense Logistics Agency, 2000).

Production

Mine.—In the Coeur d'Alene District of Idaho, Sunshine Mining Co., the sole domestic antimony producer, recovered antimony-in-concentrate as a byproduct of the treatment of complex silver-copper-antimony sulfide ore. The company answered the U.S. Geological Survey (USGS) production survey for 2000; output data are not published, however, in order to protect company proprietary information.

Smelter.—The domestic producers of primary antimony metal and oxide products were Amspec Chemical Corp., Gloucester City, NJ; Anzon Inc., Laredo, TX; Laurel Industries Inc., La Porte, TX; and U.S. Antimony Corp., Thompson Falls,

Antimony in the 20th Century

In 1900, the amount of antimony obtained from domestic ores (about 200 metric tons) was just a small fraction of the amount consumed in the United States. A moderate amount (about 1,500 tons) of antimony ore was imported and smelted in the country. But even these sources together comprised only about one-half of the total amount of antimony consumed domestically. The balance came from crude antimony in various forms that was imported for smelting. Sources of the imported antimony materials are unknown. In 1900, alloying was the major domestic use of antimony. Perhaps foremost among antimony alloys was an alloy of the metal and lead, which was widely used in the manufacture of printing type metal. Antimony imparted hardness to the alloy and had the property of expanding at the moment of solidifying, thus giving to the type a clean, sharp face. Some antimony was used in the making of babbitt metal, an antifriction alloy used in moving parts for railroad locomotives. Early in the century, pewter contained 7% antimony. A small amount of antimony was used in medicines. Total antimony consumption in 1900

in the United States was about 3,000 tons.

In 2000, the amount of antimony obtained from domestic ores (about 400 tons) was only a minuscule fraction of the antimony used in the United States. Antimony ores and crude antimony imported and smelted in the United States satisfied the bulk of the country's needs. Idaho was the only State producing antimony-in-concentrate as a byproduct of treating complex silver-copper-antimony sulfide ore. Four domestic antimony smelters processed various forms of antimony mostly into antimony trioxide used primarily for flame-retardant chemicals. Flame-retardant chemicals were a new use for antimony starting in the early 1970s and experienced strong growth since that time under the impetus of fire safety concerns about clothing for infants, plastic toys, automobile and aircraft seat covers, etc. China, the world's leading antimony producer in 2000, was the major foreign source of antimony trioxide for the United States. Total antimony use in 2000 in the Nation was about 16,700 tons.

MT. The Anzon facility closed permanently near yearend. All replied to the USGS request for production data.

Secondary.—Old scrap, mostly lead battery plates, was the predominant source of the secondary antimony output. New scrap, mostly in the form of drosses and residues from various sources, supplied the remainder. Antimonial lead was the main market for scrap antimony.

Consumption

Reported consumption of primary antimony in 2000 was 24% above that in 1999. Flame-retardants, especially plastics, accounted for most of the increase. Lead-antimony alloys were used in automotive vehicle batteries, ammunition, corrosion-resistant pumps and pipes, tank linings, roofing sheet solder, cable sheaths, and antifriction bearings. Antimony trioxide, often dissolved in an organic solvent, was used to enhance the flame-retardant properties of plastics, rubber, textiles, and other combustibles. Antimony also was used as a decolorizing and refining agent in some forms of glass such as optical glass.

Of the 164 companies to which a USGS consumption survey was sent, 140 firms responded. Consumption data were estimated for the remaining 24 firms.

Prices

In 2000, antimony prices varied within a fairly narrow range, starting and ending the year at about the same level. The New York dealers' antimony metal price, published by Platt's Metals Week, started the year at \$0.63 to \$0.70 per pound and finished the year at \$0.68 to \$0.73 per pound. This price averaged \$0.66 per pound for the year compared with \$0.63 per pound in 1999. This small increase was the first after 3 years of relatively large decreases. The price range for high-tint antimony trioxide, published by American Metal Market, was \$0.90 to \$1.05 per pound at the start of the year and \$0.89 to \$1.25 per pound at the end of the year.

Trade

Imports of antimony were, as is usually the case, much larger than exports—about five-fold larger in 2000 (tables 5-8). Imports rose slightly, with the categories of ore/concentrate and oxide registering the only gains. Australia emerged as the largest supplier of antimony ore and concentrate, accounting for 38% of the total. China remained the dominant provider of antimony metal and antimony oxide, supplying 88% of the former, and 47% of the latter.

Exports of metal alloys, waste and scrap more than doubled. Exports of antimony oxide almost doubled.

World Review

Bolivia.—The privatization sale of Corporación Minera de Bolivia's shuttered Vinto antimony smelting plant was concluded with a \$1.1 million offer from Colquiri SA, a subsidiary of Bolivia's biggest mining organization, Corporación Minera de Sur. Colquiri's bid was backed by the Commonwealth Development Corp. Ltd. (UK) and exceeded by 11 times the \$100,000 base price set by Banque Parbas, the Government's advisor for the sale (Metal Bulletin, 2000a).

China.—Reports in 2000 indicated that China's Government intended to further limit the export of antimony products. The aim of this policy was to hold exports to 60,000 t in 2000

compared with the official quota of 80,000 t in each of the previous 2 years. The Ministry of Foreign Trade and Economic Cooperation indicated that no new export licences were to be granted until 2001.

Government officials believed that smuggling of antimony, which in previous years accounted for a significant tonnage of antimony shipped abroad, had been virtually eliminated due to greater efforts against illegal shipments. Officials also projected domestic Chinese antimony consumption at 10,000 t in 2000 (Metal Bulletin, 2000b).

The Huan Dong Metal Materials Plant in Guangxi announced plans to produce 10,000 t of antimony trioxide in 2000, up 25% from 1999 output. Guangxi accounts for about 80% of China's antimony output (Platt's Metals Week, 2000a).

The Guangxi Nandan Longquan Mining and Smelting Works completed an expansion that began a year earlier, doubling ore handling capacity from 2,400 metric tons per day (t/d) to 4,800 t/d. Longquan, which previously had the capacity to produce 6,000 metric tons per year (t/yr) of antimony ingot, reached a capacity of 15,000 t/yr. The cost of the expansion project was estimated at \$12 million. Longquan accumulated 100,000 t of antimony concentrate for processing in its smelter. Its antimony ingot output in 1999 was 3,500 t; an output of 7,000 t was expected in 2000 (Platt's Metals Week, 2000b).

Outlook

Domestic antimony consumption, especially for important uses such as flame retardants, is likely to remain strong for the near future. A few new antimony mines have been developed in recent years (in Canada, for example) but continuing low antimony prices will probably prevent them from coming fully on-stream any time soon. The NDS will be selling antimony for a few more years, thus remaining as a small but readily available part of domestic supply.

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TABLE 1
SALIENT ANTIMONY STATISTICS 1/

(Metric tons of antimony content unless otherwise specified)

	1996	1997	1998	1999	2000	
United States:						
Production						
Primary:						
Mine (recoverable antimony)	242 2/	356 2/	489 r/ 2/	450 r/ 2/	W	
Smelter	25,600	26,400	24,000	23,800	20,900	
Secondary	7,780	7,550	7,710	8,220	7,920	
Exports of metal, alloys, waste and scrap (gross weight)	462	652	898	473	1,080	
Exports of antimony oxide 3/	3,990	3,230	3,270	3,190	6,040	
Imports for consumption	37,600	39,300	34,600	36,800	41,600	
Reported industrial consumption, primary antimony	13,600	13,500	12,700	13,500 r/	16,700	
Stocks, primary antimony, all classes, December 31	11,000	10,800	10,600	10,900 r/	10,300	
Price, average 4/	cents per pound	146.5	97.8	71.8	62.7	65.5
World, mine production	156,000 r/	155,000	117,000	108,000 r/	118,000 e/	

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data.

1/ Data are rounded to no more than three significant digits, except prices.

2/ Data from 10-K reports.

3/ Antimony content is calculated by the U.S. Geological Survey.

4/ New York dealer price for 99.5% to 99.6% metal, c.i.f. U.S. ports.

TABLE 2
REPORTED INDUSTRIAL CONSUMPTION OF
PRIMARY ANTIMONY IN THE UNITED STATES 1/

(Metric tons of antimony content)

Year	Class of material consumed			Total
	Metal	Oxide	Other 2/	
1999	1,570	11,800 r/	178	13,500 r/
2000	1,800	14,800	100	16,700

r/ Revised.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes residues and sulfide.

TABLE 3
 REPORTED INDUSTRIAL CONSUMPTION OF PRIMARY
 ANTIMONY IN THE UNITED STATES, BY PRODUCT 1/

(Metric tons of antimony content)

Product	1999	2000
Metal products:		
Antimonial lead	1,110 r/	864
Bearing metal and bearings	29 r/	42
Solder	136 r/	136
Other 2/	1,170 r/	1,660
Total	2,440	2,700
Nonmetal products:		
Ammunition primers	23	26
Ceramics and glass	1,120	862
Pigments	1,020	620
Plastics	1,580	1,960
Other 3/	198	647
Total	3,940	4,110
Flame retardants:		
Adhesives	140	332
Plastics	6,370 r/	8,920
Rubber	391	382
Textiles	229	221
Other 4/	14	70
Total	7,140 r/	9,930
Grand total	13,500 r/	16,700

r/ Revised.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes ammunition, cable covering, castings, sheet and pipe, and type metal.

3/ Includes fireworks and rubber products.

4/ Includes paper and pigments.

NOTE: Secondary antimonial lead was 4,410 in 1999 and 5,690 in 2000.

TABLE 4
 INDUSTRY STOCKS OF PRIMARY ANTIMONY
 IN THE UNITED STATES, DECEMBER 31 1/

(Metric tons of antimony content)

Type of material	1999	2000
Metal	2,430	2,570
Oxide	5,780 r/	4,880
Other 2/	2,720	2,860
Total	10,900 r/	10,300

r/ Revised.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes ore and concentrate, residues, and sulfide.

TABLE 5
U.S. EXPORTS OF ANTIMONY METAL, ALLOYS, AND WASTE AND SCRAP,
BY COUNTRY 1/

Country	1999		2000	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Brazil	9	\$16	--	--
Canada	153	302	274	\$525
Chile	--	--	6	16
Colombia	--	--	10	16
El Salvador	20	34	10	17
Japan	24	235	10	119
Korea, Republic of	--	--	40	48
Mexico	230	508	721	1,630
Switzerland	6	45	1	21
Thailand	24	494	2	72
Other	6	176	4	355
Total	473	1,810	1,080	2,820

-- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 6
U.S. EXPORTS OF ANTIMONY OXIDE, BY COUNTRY 1/

Country	1999			2000		
	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)
Argentina	94	78	\$293	115	95	\$302
Australia	196	163	463	128	106	254
Belgium	1	1	5	13	11	40
Brazil	19	16	73	98	81	386
Canada	1,420	1,180	3,280	1,730	1,440	3,930
China	376	312	1,140	134	111	264
Colombia	174	144	389	118	98	214
France	57	47	158	50	42	130
Germany	119	99	420	102	85	438
Indonesia	36	30	91	--	--	--
Italy	1	1	6	--	--	--
Japan	90	75	216	130	108	509
Korea, Republic of	27	22	138	55	46	135
Mexico	688	571	1,670	3,820	3,170	5,680
Singapore	75	62	176	77	64	158
Spain	78	65	274	48	40	181
Taiwan	23	19	69	29	24	78
Turkey	47	39	146	62	51	189
United Kingdom	218	181	703	402	334	834
Other	108 r/	89 r/	331 r/	151	125	463
Total	3,840	3,190	10,000	7,280	6,040	14,200

r/ Revised. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Antimony content is calculated by the U.S. Geological Survey.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY, BY CLASS AND COUNTRY 1/

Country	1999			2000		
	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)
Antimony ore and concentrate:						
Australia	1,660	1,070	\$710	1,750	1,150	\$751
Austria	95	66	307	140	98	392
Bolivia	--	--	--	220	144	101
China	436	398	508	1,000	1,000	1,550
France	--	--	--	6	3	18
Hong Kong	59	53	52	62	60	65
Mexico	1,340	1,290	1,770	937	903	1,170
Russia	--	--	--	499	315	193
Thailand	--	--	--	20	16	12
Total	3,590	2,870	3,350	4,630	3,690	4,250
Antimony oxide:						
Belgium	3,290	2,730	5,890	3,690	3,070	6,560
Bolivia 3/	1,770	1,470	2,110	1,150	957	1,220
Chile 3/	275	229	328	--	--	--
China	9,470	7,860	11,800	13,100	10,900	17,300
France	233	193	329	66	54	230
Germany	16	14	277	47	39	802
Guatemala	249	207	428	77	64	132
Hong Kong	420	349	523	453	376	622
Japan	127	105	700	33	27	274
Kyrgyzstan	--	--	--	224	186	247
Mexico	3,560	2,950	4,710	5,530	4,590	7,660
Netherlands	178	148	193	--	--	--
South Africa	3,220	2,680	938	3,830	3,180	999
Taiwan	--	--	--	29	24	53
Thailand	--	--	--	60	50	11
United Kingdom	244	202	699	176	146	298
Total	23,100	19,100	28,900	28,500	23,700	36,500

-- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Antimony ore and concentrate content reported by the U.S. Census Bureau. Antimony oxide content is calculated by the U.S. Geological Survey.

3/ Antimony oxide from these countries believed to be "crude" and would probably be shipped to refineries for upgrading.

Source: U.S. Census Bureau.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY METAL, BY COUNTRY 1/

Country	1999		2000	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Bolivia	(2/)	(2/)	100	\$145
Canada	58	\$303	62	274
China	13,100	15,800	12,500	16,400
Germany	(2/)	167	(2/)	114
Hong Kong	267	270	206	222
Japan	10	481	14	498
Kyrgyzstan	(2/)	(2/)	41	53
Mexico	736	524	801	555
Peru	209	219	210	275
Singapore	400	439	300	316
Taiwan	(2/)	11	--	--
United Kingdom	(2/)	204	--	--
Other	9	10	11	271
Total	14,800	18,500	14,200	19,100

-- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 9
ANTIMONY: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1996	1997	1998	1999	2000 e/
Australia 3/	1,800	1,900	1,800	2,300 r/	1,800
Bolivia	6,488	5,999	4,735	2,790 r/	2,800
Canada 4/	1,716	529	428	357 r/	364 5/
China e/	129,000	131,000	97,400	89,600 r/	100,000
Guatemala	880	880	440	440 e/	450
Honduras	400	300	-- e/	-- e/	--
Kyrgyzstan e/	1,200	1,200 5/	150	100	150
Mexico 6/	983	1,909	1,301	273 r/	52 p/
Morocco e/ 4/	152 5/	160	160	150	150
Namibia (Sb content of sodium antimonate)	8	--	-- e/	-- e/	--
Peru (recoverable) e/	460	460	460	460	460
Russia (recoverable) e/	6,000	6,000	4,000	4,000	4,500
South Africa 4/	5,137	3,415	4,243	5,278 r/	5,000
Tajikistan e/	1,000	1,200 5/	1,500	1,800	2,000
Thailand (content of ore and concentrate)	63 r/	53 r/	199 r/	59 r/	84 5/
Turkey	285	31	30 e/	180 r/ e/	360
United States	242	356	489 r/	450 r/	W
Zimbabwe 4/	5 e/	--	--	--	--
Total	156,000 r/	155,000	117,000	108,000 r/	118,000

e/ Estimated. p/ Preliminary. r/ Revised. W Withheld to avoid disclosing company proprietary data; not included in "Total." -- Zero.

1/ World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

2/ Antimony content of ore unless otherwise indicated. Table includes data available through June 8, 2001.

3/ Antimony content of antimony ore and concentrate, lead concentrates, and lead-zinc concentrates.

4/ Antimony content of concentrate.

5/ Reported figure.

6/ Antimony content of antimonial lead, natural minerals, and other smelter products produced.